

FIGURE 5. 1943 aerial photograph of Drum Inlet on Core Banks, NC shows the development of the ebb-tide delta (ETD) on the ocean side and the flood-tide delta (FTD) on the estuarine side of the barrier. Aerial photography from US ACE archives in Wilmington, NC.

4. Locally, sand-rich geologic units are exposed on the shoreface and inner continental shelf (Riggs and Cleary, 1997, 1998; Boss and Hoffman, 2000; Thieler et al., 2006).

Complex Barrier Islands – Welding Pieces Together

Nags Head Woods, Jockeys Ridge, and Shackleford Banks are characterized by extensive back-barrier dune fields, whereas Buxton Woods, Kitty Hawk Woods, and Bogue Banks are characterized by a series of beach-ridge and swale structures (Fig. 6).

Kitty Hawk Woods are fronted by a dune field that was still active in 1932. The source of the dune sand was overwash occurring east of N.C. Highway 158. Construction of Highway 12 in 1932 and a barrier dune ridge in the late 1930s, in concert with subsequent development, has led to stabilization of the dune field, termination of modern overwash processes, and elimination of the sand source from the beach that fed the dune field (Fig. 7). Coastal development at Kitty Hawk is threatened, as indicated by the reduced distance from the shoreline to NC Highway 12 in the 1932 and 1999 aerial photographs (Fig. 7).

Simple Barrier Islands – Inlet and Overwash Dynamics

Storm surges are critical processes on low and narrow simple barrier islands (Fig. 4). They may open shallow inlets that build back-barrier flood-tide deltas or they may overtop the barrier depositing overwash fans on top of the barrier and as back-barrier shoals. These processes build both island width and island elevation and are critical for barrier island health and migration as sea level rises.

Recent research from Oregon Inlet to Cape Hatteras (Smith et al., 2006) suggests that between 50 and 70% of this area have had one or more inlets during the past several hundred years. Up to 70% of the sand-poor islands in the Onslow Bay compartment have had one or more inlets during the past several hundred years (Riggs et al., 1995). Inlets are high energy, self-adjusting safety valves in the barrier island sand dam that open during storms to let the increased water volume (from increased river flow due to heavy rainfall or from increased storm surge) to flow either in or out. When storm and river floods abate, inlets close back

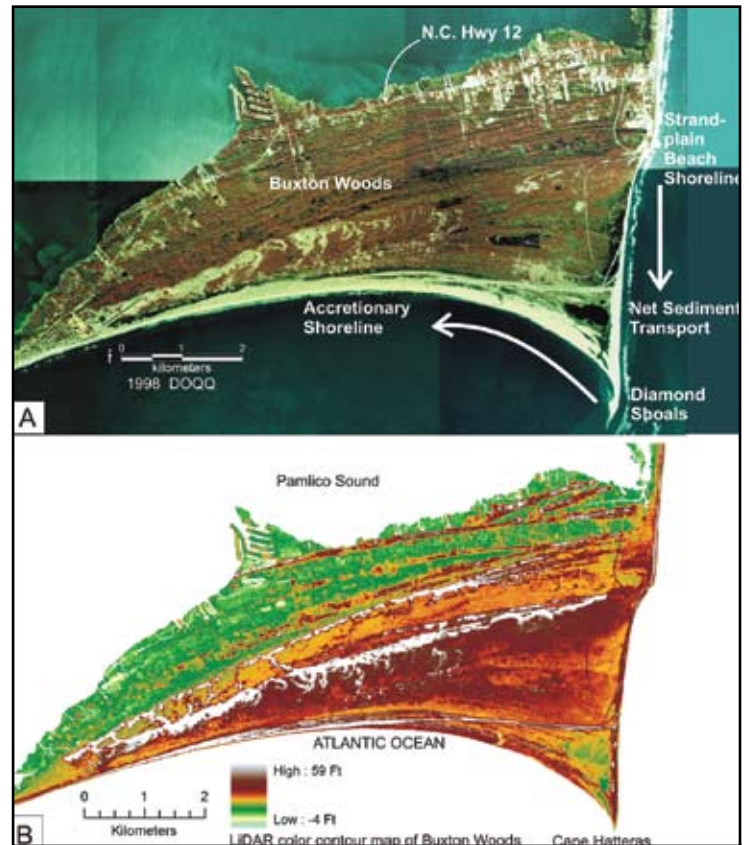


FIGURE 6. Panel A is a 1998 aerial photograph of Buxton Woods complex barrier island at Cape Hatteras, NC. Panel B is a 2001 LiDAR geomorphic contour map that shows the elevations of the beach ridges and intervening swales.